

Claims

- 5 1. A method of correcting distortions in magnetic resonance (MR) data, comprising:
- a) providing distorted MR data of an object of interest and distortion parameters for one or more generic objects;
 - 10 b) determining transformation parameters correlating the object of interest and one or more of the generic objects; and
 - c) processing the distorted MR data taking into account the distortion parameters and the transformation parameters to obtain corrected MR data.
- 15 2. The method of claim 1, wherein the distortion parameters of a particular generic object are derived from magnetic field inhomogeneities resulting from the magnetic susceptibility distribution of the generic object.
- 20 3. The method of claim 2, wherein the magnetic field inhomogeneities are measured or calculated from distorted MR data of the generic object.
- 25 4. The method of claim 3, wherein calculating the magnetic field inhomogeneities includes determining the magnetic susceptibility distribution of the generic object from the distorted MR data of the generic object and deriving the magnetic field inhomogeneities from the determined susceptibility distribution using a multi-grid approach.
- 30 5. The method of one of claims 1 to 4, wherein in step b) the transformation parameters are determined on the basis of magnetic susceptibility data of the object of interest which are derived from the distorted MR data.
- 35 6. The method of one of claims 1 to 5, wherein step b) includes:
- processing the distorted MR data to identify at least one region of common or changing magnetic susceptibility; and
 - determining the transformation parameters that deform the at least one region determined from the distorted MR data onto a corresponding region of one or more of the generic objects.

7. The method of one of claims 1 to 6, wherein step c) includes:

- calculating distortion parameters for the object of interest taking into account the distortion parameters for the one or more generic objects and the transformation parameters; and
- reverse-applying the distortion parameters for the object of interest to the distorted MR data of the object of interest or to data derived therefrom.

8. The method of one of claims 1 to 7, wherein in step a) for a particular generic object several sets of distortion parameters for different gradient field strengths are provided and wherein for step c) this set of distortion parameters is selected which corresponds to the gradient field strength that was used while generating the distorted MR data of the object of interest.

9. The method of one of claims 1 to 8, further comprising determining the gradient field strength that was used while generating the distorted MR data of the object of interest by co-generating MR data of a phantom object.

10. The method of one of claims 1 to 9, wherein MR data of the phantom object are co-generated to redundantly verify the correction of the distorted MR data of the object of interest.

11. The method of one of claims 1 to 10, wherein for one and the same object of interest steps a) to c) are repeated at least once at different points in time to detect chronological changes of the object of interest.

12. The method of claim 11, wherein MR data generated for one and the same object of interest at different points in time are registered relative to each other.

13. The method of one of claims 1 to 12, further comprising providing computer tomography (CT) or fluoroscopic data of the object of interest and registering the CT or fluoroscopic data and the corrected MR data of the object of interest relative to each other.

14. The method of one of claims 1 to 13, further comprising generating a graphical display of the corrected MR data or of data derived therefrom, determining the current position of at least one of a surgical tool and a pointer with respect to the MR data or the data derived therefrom, and superimposing the current position on the graphical display.
15. Use of the corrected MR data obtained by the method of one of claims 1 to 14 for navigation in bone surgery.
16. A computer program product comprising program code portions for performing the steps of one of claims 1 to 15 when the computer program product is run on a computer system.
17. The computer program product of claim 16, stored on a computer readable recording medium.
18. An apparatus (10) for correcting distortions in magnetic resonance (MR) data, comprising:
- a common database (12) or separate databases for at least temporarily storing distorted MR data of a object of interest and distortion parameters for one or more generic objects;
 - a unit (14) for generating transformation parameters correlating the object of interest and one or more of the generic objects; and
 - a unit (16) for processing the distorted MR data taking into account the distortion parameters and the transformation parameters to obtain corrected MR data.